4. *Geological Notes of a Journey in South Australia from Cape Jervis to Mount Serle.* By ALFRED R. C. SELWYN, Government Geologist, Victoria.

HAVING been invited by the South Australian Government to visit that colony for the purpose of examining into and reporting on the geological evidence of the probable extent and character of its gold-bearing rocks, as also on any indications of the existence of workable coal-fields, and the applicability of the Artesian principle for securing a permanent supply of water in the northern districts, and generally on its geological structure, it was with much pleasure that I embraced the opportunity thus afforded of instituting a comparison by personal examination between the rock formations of Victoria and those of supposed similar age in the sister colony.

On the receipt of the invitation, therefore, I immediately applied for leave of absence from my official duties in Victoria for a period of two months. This was at once granted by the Chief Secretary, to whom a communication on the subject had also been made by the South Australian Government.

I arrived at Adelaide on Sunday, the 1st of May, 1859. On Monday, the 2nd of May, I communicated with the Hon. F. Dutton, the Commissioner of Crown Lands, for the purpose of making such arrangements as would enable me to commence my examination without delay, and extend it over as large an area as possible in the limited time at my disposal.

From the rapid way in which I passed over the country, and the consequent very cursory examination I was able to make of any one locality, it will be impossible for me, in this Report, to enter into any minute geological and lithological details. I propose, therefore, in the first place, simply to give extracts from my rough notes as they were written from day to day, in order to indicate the general line of route followed, and at the same time to show, to some extent, the opinion formed of each locality at the time it was examined. I shall then briefly state, in conclusion, the opinion I have now arrived at regarding the main points to which my attention was directed.

Since my return to Melbourne, I have read Mr. Babbage's Reports, made in 1856, to the Chairman of the Gold Search Committee, and regret exceedingly that I had not an opportunity of seeing them before commencing my examination, as I now find that much of the country I traversed had previously been examined by Mr. Babbage; and that, amongst much interesting geological information, he mentions the occurrence of rocks that quite escaped my observation.

(Here follow, in the original Report, several pages of extracts from Mr. Selwyn's notes; the conclusions at which he arrived are thus stated:)

It is much to be regretted, and I was greatly disappointed, that I did not find the smallest trace of organic remains in any of the older rocks of the South Australian chain, though carefully looked for from Cape Jervis to Mount Serle; unless indeed the peculiar circular and oval-shaped markings in the quartzose sandstones west of Port Augusta are annelide tracks. In order to ascertain this, it would be advisable that a number of them should be collected for examination. In the absence of such fossil evidence, and without a much more minute and extended survey than I was able to make in the limited time at my disposal, and in the rapid manner in which I traversed the country, it is almost premature to express any opinion, either as to the probable age, or even super-position, of the various rock masses forming the central mountain chain of South Australia. I am, however, inclined to think that they may eventually be grouped under three distinct and unconformable formations. Whether all of them are members of the Cambrian and Silurian series, or whether they extend up to the Devonian and Old Red, it is quite impossible to

decide until fossiliferous beds are found; by which a fixed starting-point can be determined.

Taking them in their descending order, they are:—

1st. Those beds which occupy, in great anticlinal and synclinal undulations, the whole of the country north to Mount Serle, from a line drawn from the head of the Willochra north-easterly to the head of the Siccus River, consisting chiefly of the upper quartzose sandstone and quartz-rock series; which, commencing with the summit of Mount Remarkable, extends through all the peculiar flat-topped and tent-shaped hills west of Port Augusta, and forms generally the summits of all the higher peaks and ranges as far north as Mount Serle, including the singular and picturesque Pound Ranges at Wilpena and Warraweena.

2nd. The beds that occupy the whole of the country south from the above-mentioned line to Cape Jervis, consisting chiefly of slates, shales, and sandstones of various textures and colours, with intercalated bands of gneissose, euritic, and micaceous schists, bands of quartz-rock, and crystalline limestone, associated in certain localities, from the Gawler River south to Cape Jervis and Port Elliot, with eruptive granitic and hornblendic rocks.

3rd. A series of beds, certainly the lowest in geological position in the whole of the central chain, but occupying a comparatively small area, chiefly confined to the watershed of the Onkaparinga. On these the only profitable gold-field hitherto discovered in South Australia is situated, and it is, I think, along the axis of these lower beds only, that any important extension of the already known auriferous area can be expected.

It is just possible that no such natural divisions exist in the rocks of the South Australian chain as are here sketched out, and that the difference in general mineral and lithological characters observed, between the northern and southern rocks, is entirely due to the metamorphic influence of the granitic axis that, at Cape Jervis, extends in a north-easterly direction, showing itself at intervals on the surface to Angaston, and then seems to break through the chain and continue its course to the north-east, passing under the great tertiary flats of the Murray basin; and, in all probability, again re-appearing in the Barrier or Stanley Ranges.

The only locality in which the rocks of the South Australian central chain bear any decided resemblance in mineral and physical structure to the auriferous Silurian rocks of Victoria is in the valley of the Onkaparinga.

I do not think that there are any rocks whatever in those portions of the colony that I examined, that would indicate the presence of a carboniferous formation either of palæozoic or oolitic age. The supposed coal found near Adelaide is a tertiary lignite, which I have no doubt abounds in many parts of the extensive unexplored tertiary basins of South Australia, as it does in rocks of the same age in Victoria.

Though thus apparently deficient in rich deposits of the precious metal, so lavishly distributed in Victoria, South Australia possesses many other great natural resources on which she may safely rely for future prosperity. Her iron ores are rich and abundant; as also her copper and lead mines, which, I have no doubt, will go on steadily increasing in number and importance; as also her vineyards and corn-fields, that are capable of producing grain of the finest quality, and wines that may be expected to vie with the best that are grown in Europe. At Pewsey Vale, Mr. Gilbert already grows wine that is little, if at all, inferior to the highest class of continental wine of a similar description; and I have no doubt that, with greater experience in the manufacture, and labour less costly, a corresponding improvement in quality, as well as reduction in cost, will be effected.

In the north, the fine, open, available agricultural lands are very extensive; and though, on account of the dryness of the soil and the great heat, they may not be well adapted for the growth of wheat, they would, I have no

doubt, produce fine crops of maize, sorgham, millet, gram, and other products, that are successfully cultivated in somewhat similar soils and climates in other countries. It is a mistake to suppose that the soil generally on the northern plains is poor and sandy: with sufficient moisture it would, I believe, be exceedingly fertile; it consists almost everywhere of a very fine red calcareous loam, so dry as easily to be mistaken for sand, unless closely examined. With the exception, however, of this deficiency in moisture, there is little difference between it and some of the richest soils of the Adelaide and Gawler plains.

With respect to the water supply, I think that any efforts made to obtain this should be directed, with certain local exceptions, towards constructing reservoirs for retaining surface water, for which the physical outline of many parts of the country is eminently adapted, rather than to boring for Artesian springs, for which the requisite geological conditions do not generally exist, and which are farther rendered unadvisable on account of the so commonly saline character of the underground waters in all those tertiary areas within which the required conditions might possibly be found.

I regret that I have not been able to give a more favourable account of the prospects of South Australia either as a gold or coal producing country. Respecting the former, I would, however, distinctly point out, that in the southern districts (or the country lying south of the coloured line drawn on the accompanying map, from near Mount Remarkable, north-east to the head of the Siccus River), beyond a generally unfavourable impression, I have no very good reason to adduce, why some of the numerous quartz veins, that are there found associated with the slaty and arenaceous rocks, should not be auriferous, especially supposing those rocks to be of Silurian age. This is a very important point, and one on which, as yet, unfortunately, we have no reliable information: as it is, however, very desirable that it should, if possible, be determined, and as this can only be effected by the discovery of organic remains, I would suggest that, in future, all the Government Assistant Surveyors should be directed to search carefully for such fossil evidence in the rocks of every district in which they are employed.